

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY

ORDER OF THE SUPERVISOR OF WELLS

IN THE MATTER OF

THE PETITION OF JORDAN DEVELOPMENT COMPANY,)
L.L.C., FOR AN ORDER FROM THE SUPERVISOR OF)
WELLS APPROVING A PLAN OF UNITIZATION FOR)
PRIMARY, SECONDARY, AND ENHANCED RECOVERY) ORDER NO. 03-2011
OF OIL, GAS, AND RELATED HYDROCARBONS, AND)
ABROGATING EXISTING SPACING AND PRORATION)
ORDERS AND RULES IN SPRINGDALE TOWNSHIP,)
MANISTEE COUNTY.)

OPINION AND ORDER

This case involves the Petition of Jordan Development Company, L.L.C. (Petitioner), for approval of enhanced and/or secondary recovery operations in the Field (Springdale 21/22 Field). The Petitioner is requesting: (i) approval of a unitized operation of the Springdale 21/22 Field (proposed Unit Area), pursuant to Part 617, Unitization, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA); (ii) approval of a secondary recovery operation pursuant to Section 61506(i) of Part 615, Supervisor of Wells, of the NREPA, and R 324.612; and (iii) approval to operate the proposed Unit Area as an exception to the applicable spacing provisions of Part 615 and its administrative rules. The proposed Springdale 1/22 Unit Area is the NE 1/4 and NE 1/4 of SE 1/4 of Section 21; and the NW 1/4, N 1/2 of SW 1/4 and SE 1/4 of SW 1/4 of Section 22, T24N, R14W, Springdale Township, Manistee County, Michigan.

Jurisdiction

The development of oil and gas in this state is regulated under Part 615, Supervisor of Wells, of the NREPA, MCL 324.61501, *et seq.* The purpose of Part 615 is to ensure the orderly development and production of the oil and gas resources of this state, with a view to the ultimate recovery of the maximum production of these natural resources. MCL 324.61502. To the end of maximizing recovery, the Supervisor of Wells (Supervisor) regulates secondary recovery methods for oil and gas, including the

introduction of substances into producing formations, for purposes of enhancing production. MCL 324.61506(i). A person proposing secondary recovery by injection of a fluid into a producing formation must file a petition for a public evidentiary hearing. 1996 MR 9, R 324.612. The evidentiary hearing is governed by the applicable provisions of the Administrative Procedures Act, 1969 PA 306, as amended, MCL 24.201 *et seq.* See 1996 MR 9, R324.1203. The evidentiary hearing in this matter was held on March 15, 2011.

FINDINGS OF FACT

The Petitioner specifically requests that the Supervisor issue an order allowing the Petitioner to inject fresh water into the Guelph Dolomite/Ruff Formation, the productive zone, for purposes of secondary recovery and exempt the proposed Springdale 21/22 Unit from the applicable spacing and proration rules and orders.

In support of its case, the Petitioner offered the testimony of William C. Quinlan, Production and Engineering Manager for Jordan Exploration Company and Adam R. Biteman, Project Manager and Geologist for Gosling Czubak Engineering Sciences. Both Mr. Quinlan and Mr. Biteman were found to be experts in their respective fields.

The Administrative Law Judge determined the Notice of Hearing was properly served and published. Two letters in objection to the Petition were filed with the Supervisor by Rich and Marianne Singletary and Shirley Kuhn, however, neither Mr. and Mrs. Singletary nor Ms. Kuhn appeared at the hearing. Both letters expressed concerns with withdrawal of groundwater. No one appeared at the hearing in opposition to the Petition. The Supervisor designated the hearing to be an evidentiary hearing pursuant to R 324.1205(1)(b) and directed substantive evidence be presented in the form of oral testimony.

I. Unitization

Mr. Quinlan testified all mineral interests in the proposed Unit Area are subject to oil and gas leases and that more than 80 percent of owners entitled to royalty within the proposed Unit Area have ratified the Petitioner's Plan of Unitization (Exhibit N). In

addition 100 percent of working interest owners and over 95 percent of working interest and royalty owners combined have ratified the Plan of Unitization.

I find that the Petitioner is qualified to be named Unit Operator and has obtained sufficient approval to support entry of a final order approving the Plan of Unitization and approving unit operations pursuant to Part 617.

II. Unit Area

The Verified Petition in this matter states that the Petitioner plans to conduct unitized operations within a Unitized Formation described as the stratigraphic equivalent of that portion of the Brown and Gray Niagaran Formations [in current nomenclature known as the Guelph Dolomite and Gray Niagara Member of the Lockport Dolomite] encountered in the interval from 4997 measured depth (MD) to 5024 MD in the State Springdale & Lucking 1-21 well [Permit No. 46775] located in the NE 1/4 of NE 1/4 of NE 1/4 of Section 21, T24N, R14W, Springdale Township, Manistee County, Michigan.

Mr. Quinlan testified the regional Brown and Gray Niagaran Formation the Petitioner intends to unitize extends beyond the boundary of the proposed Unit Area, to the north, east, and west. He stated the proposed Unit Area was chosen to incorporate the State Springdale & Wilburn 1-21HD [Permit No. 56146] and the State Springdale 7-21HD [Permit No. 56337] and the State Springdale & Mann 9-21HD [Permit No. 56887] wells. These wells were all drilled parallel to one another in a west to east direction and are ideally configured to test the effects of water flooding by injecting water in the central well and displacing oil to the adjoining wells. Exhibit I indicates the relative productivity of the pool in the proposed Unit Area.

I find the Unitized Formation as proposed by the Petitioner is reasonable and appropriate and should be approved. I find the boundaries of the proposed Unit Area are appropriate.

III. Secondary Recovery

Mr. Quinlan testified the Springdale 15/16 Field has been in production since 2003 and has cumulatively produced approximately 734,000 barrels of oil and 4 BCF of gas. There are three horizontal wells within the proposed Unit Area; the State Springdale & Wilburn 1-21HD, the State Springdale 7-21HD, and the State Springdale &

Mann 9-21HD. The State Springdale 7-21HD and the State Springdale & Mann 9-21HD wells are presently at or near economic limit (Exhibit E). The three wells in the proposed Unit Area have produced a combined 252,840 barrels of oil (Exhibit F). The State Springdale & Wilburn 1-21HD has approximately 20,000 barrels of remaining primary reserves to be recovered.

Mr. Quinlan testified a waterflood operation is a reasonable means of extending the life of the field. The wells are well configured to accommodate that development going forward while minimizing the need for additional drilling, pipeline work, and surface disruption. He stated continuing to produce the three wells under primary production operations would result in a 19 percent recovery factor, or approximately 405,875 barrels of oil, for the proposed Unit Area (Exhibits F, I-K). With the Petitioner's proposed secondary recovery operations, Mr. Quinlan estimates a recovery rate of approximately 38 percent.

The Petitioner initially proposes to convert one existing well, the State Springdale 7-21HD, to a water injection well and inject fresh water at a maximum rate of approximately 3,000 barrels per day, with decreasing injection rates to likely occur within the first year of operations dependent upon the rate at which the injection well will accept fluid at or below the maximum injection pressure of 1695 psig at surface. The fresh water will come from a fresh water source at the existing Springdale 16 CPF site (Exhibit M). At this time, the Petitioner has no plans to drill additional wells. Mr. Quinlan indicated that if an additional well was drilled in the Unit Area, it would not affect the allocation of production within the unit.

Mr. Quinlan's secondary recovery production forecast and estimated economics (Exhibit L) indicate the project will be profitable. Mr. Quinlan estimated that water injection in the proposed Unit Area would result in incremental oil recovery nearly matching the projected primary reserves for the unit. Secondary recovery operations would have an estimated capital cost of \$251,115 and the cost of operations of \$28,500 per month.

Based on Petitioner's analysis, there is evidence of significant amounts of oil remaining in the reservoir. I find the testimony indicates the proposed Unit Area

contains accumulations of hydrocarbons that will not be recovered by primary production of the wells in the field, but may be recovered by secondary recovery operations conducted as a part of a unitized operation. I find the estimated additional cost of unitized operations will not exceed the value of the additional hydrocarbons recovered, and the unitization requested is reasonably necessary to substantially increase recovery of oil from the proposed Unit Area and avoid waste.

Mr. Quinlan testified that the Petitioner proposes to allocate production in the proposed Unit Area based on the ultimate expected primary recovery of each of the original three drilling units, as shown in Exhibit A to the Plan of Unitization. I find such allocation of production is fair, reasonable, and equitable as required by Section 615705 of Part 617.

The Petitioner requests abrogation of spacing requirements within the proposed Unit Area to assist in implementing its Plan of Unitization and proceeding with unitized operations, including secondary recovery.

I find the type of operations contemplated by the Petitioner are feasible, will prevent underground waste by recovering oil not otherwise recoverable, and will protect correlative rights. I find abrogation of the existing well location requirements is necessary to implement the Plan of Unitization and proceed with unitized operations, except no well shall be completed in the Unitized Formation at a location closer than 330 feet from the outside boundary of the proposed Unit Area. I further find the allocation of production to the separately-owned tracts is fair, reasonable, and equitable as required by Section 615705 of Part 617.

IV. Hydrogeologic Investigation

Mr. Biteman testified that a hydrogeological investigation for the proposed waterflood was conducted (Exhibit O) to evaluate the groundwater aquifer within the project area and to evaluate for potential negative impact on area water supplies or surface water bodies. Mr. Biteman's study indicates that the aquifer below the proposed site is capable of providing the water necessary for the Petitioner's operations and that the proposed waterflood would not have an adverse impact on surface waters or potable water wells located within the vicinity of the Springdale 21/22 area.

Office of Geological Survey (OGS) staff has reviewed the Hydrogeologic Investigation Report and concur with Mr. Biteman's conclusions (Exhibit P). In addition, staff has determined the proposed pumping rate and depth of the water supply well as outlined in the Hydrogeologic Investigation Report pass the screening process in "Zone A" of Michigan's Water Withdrawal Assessment Tool. OGS Cadillac District staff will require water level monitoring at the facility over a period of time to demonstrate that limited drawdown in the shallow aquifer at the facility matches model predictions as outlined in the Hydrogeologic Investigation Report. I find the Petitioner's proposed waterflood operations will not adversely affect surface water or water supplies in the area.

CONCLUSIONS OF LAW

Based on the findings of fact, I conclude, as a matter of law:

1. The applicable spacing for the proposed Unit Area is 80 acres as established by Special Order No. 1-73, as amended. Exceptions to this Order may be granted by the Supervisor.
2. The Supervisor may regulate the secondary recovery methods of oil and gas, including the introduction of gas, air, water, and other substances into the producing formations. MCL 324.61506(i).
3. A person desiring to inject water, gas, or other fluid into a producing formation or use other technology for the purpose of increasing the ultimate recovery of hydrocarbons from a reservoir shall file a petition for hearing. 1996 MR 9, R 324.612(1).
4. The operator of a secondary recovery project shall keep accurate records of all oil, gas, and brine produced; volumes of fluids injected; and injection pressures. The operator shall file reports of the data and other data as may be required with the Supervisor at regular intervals, as specified. 1996 MR 9, R 324.612(2).

5. The Supervisor has jurisdiction over the subject matter and the persons interested therein.

6. Due notice of the time, place, and purpose of the hearing was given as required by law, and all interested persons were afforded an opportunity to be heard. 1996 MR 9, R 324.1204.

DETERMINATION AND ORDER

Based on the Findings of Fact and Conclusions of Law, the Supervisor determines that the Unit Area is appropriate and that secondary recovery operations will prevent waste.

NOW, THEREFORE, IT IS ORDERED:

1. The Petition of Jordan Development Company, L.L.C., is granted and the proposed Unit Area is created in accordance with, and subject to, this Order and the provisions of the Plan of Unitization, which is hereby incorporated by reference. The proposed Unit Area shall hereafter be known as the Springdale 21/22 Unit.

2. Jordan Development Company, L.L.C. is appointed Unit Operator.

3. The Springdale 21/22 Unit is described as:

Section 21: NE 1/4 and NE 1/4 of SE 1/4

Section 22: NW 1/4 and N 1/2 of SW 1/4 and SE 1/4 of SW 1/4

T24N, R14W

Springdale Township, Manistee County, Michigan

4. The Unitized Formation is described as:

[T]he stratigraphic equivalent of that portion of the Brown and Gray Niagaran Formations encountered in the interval from 4997 measured depth (MD) to 5024 MD in the State Springdale & Lucking 1-21 well (Permit No. 46775) located in the NE 1/4 of NE 1/4 of NE 1/4 of Section 21, T24N, R14W, Springdale Township, Manistee County, Michigan.

5. Jordan Development Company shall notify the Supervisor between thirty (30) and sixty (60) days prior to the commencement of injection operations and between thirty (30) and sixty (60) days prior to the anticipated date of cessation of unit operations. The Petitioner shall comply with the filing requirements of R 324.610, R 324.612, and R 324.806 of the administrative rules of Part 615 and shall obtain such approvals as are necessary from the Department of Environmental Quality.

6. Each tract within the Springdale 21/22 Unit shall participate in the unit production and other benefits and burdens of unit operations in accordance with the Plan of Unitization.

7. Operation of the Springdale 21/22 Unit shall be conducted exclusive of, and as an exception to, all applicable spacing orders and rules, except no well may be completed in the Unitized Formation at a location closer than three hundred thirty (330) feet from the outside boundaries of the Springdale 21/22 Unit Area. Jordan Development Company, L.L.C., is authorized to produce wells on the Unit Area at rates that result in the maximum efficient recovery of hydrocarbons. All other applicable provisions of the administrative rules of Part 615 shall be adhered to.

8. Jordan Development Company, L.L.C., is authorized to inject fresh or produced water into the Brown and Gray Niagaran Formation. Jordan Development Company, L.L.C., may only inject other substances upon receipt of written approval from the Supervisor. The rate of withdrawal from the fresh water well shall not exceed ninety (90) gallons per minute without first receiving the written approval of the Supervisor.

9. The Plan of Unitization, which constitutes the plan for unit operations, is hereby approved, and unit operations thereunder may be commenced as of the effective date determined by the Unit Operator consistent with Article 24 of the Plan of

Unitization. Cessation of the unit operations shall be in accordance with the Plan of Unitization and only with the written approval of the Supervisor.

10. The Supervisor retains continuing jurisdiction over the Springdale 21/22 Unit in order that the Supervisor may exercise such administrative control as is consistent with the powers and duties of the Supervisor, as established by Part 615 and Part 617.

11. This Order shall be effective immediately.

Dated: May 9, 2011


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